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CHAPTER 6

WATER TREATMENT PLANT WASTES

6-1. Quantities and characteristics of wastes. In connection with water treatment plant location and design, the disposal of the wastes generated during the various treatment processes must receive consideration. Among these wastes are sludge from presedimentation basins, coagulation sludge, filter wash water, spent regenerant and rinse water from ion-exchange softeners, and mineral wastes from desalination facilities.

6-2. Waste management.

a. Water-treatment sludges.

(1) Presedimentation sludge. Presedimentation sludge may be disposed of by returning it to the stream from which the raw water was taken, provided the sludge is deposited in such a manner that it will not impede flow. The sludge could be dewatered in lagoons or sludge drying beds and then hauled to landfills or spread on land as an alternative.

(2) Coagulation sludge.

(a) Lagoons. If land is available near the treatment plant, alum sludge can be placed in lagoons to affect further concentration of solids. Depending on the local climate and the properties of the sludge, the final solids content in the lagoon may be as low as 1 percent or as high as 17.5 percent. Water should be removed from the lagoon by decantation. The decanted water may be returned to natural watercourses if deemed safe, and is sometimes returned to the treatment plant for recycling. Lagoons should be of sufficient size to contain the sludge generated per day for 1,825 days (5 years), plus precipitation less any decantation, evaporation, disposed sludge, or other losses. At least two lagoons should be provided so that fresh alum sludge can be placed in one while the alum sludge in the other is allowed to concentrate. After sufficient drying, the sludge should be removed from the lagoon and placed in a landfill or spread on suitable ground. The minimum solids content which should be attained before alum sludge can be removed from lagoons is generally about 10 percent. In colder climates, the freeze-thaw cycles to which the liquid in the lagoon is subjected will aid materially in concentrating the solids. Sludge lagoons should be enclosed by adequate fencing to exclude children and animals.

(b) Discharge to sanitary sewers. Alum sludges may also be discharged to sanitary sewers if disruption of wastewater treatment processes is not anticipated. If this procedure is chosen, precautions must be taken to insure that the sludge does not create a hydraulic

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overload in the sewers or form significant deposits in the sanitary sewer. Inasmuch as a large portion of alum sludge is not biodegradable, the addition of alum sludge to wastewater will increase the sludge production at the wastewater treatment plant. Disposal of alum sludge to storm sewers is equivalent to disposal in natural watercourses and should not be attempted.

(c) Sludge beds. Another method of dewatering is application of the sludge to special sludge beds. These beds are usually composed of 6 to 12 inches of sand ranging in size up to 0.5 millimeter, with an underdrain system of graded gravel 6 to 12 inches deep. Drain pipes 6 to 8 inches in diameter are placed in the gravel to carry away the water from the beds. Sand beds can usually achieve a 20 percent solids concentration in alum sludge within 100 hours at a loading rate of 0.8 psf. However, the results are highly dependent on the characteristics of the sludge and local climatic conditions. Warm, dry climates are best suited to the use of sand drying beds. The water passing into the drain pipes should be suitable for disposal into natural watercourses. The dewatered sludge is usually removed from the sand bed by mechanical means, but a minimum solids content of approximately 20 percent must be attained before mechanical handling is practical. After removal, the dewatered sludge is usually hauled to a landfill.

(d) Mechanical dewatering devices. Several mechanical devices have been used for dewatering of alum sludge, including pressure filters, centrifuges, freeze-thaw devices, vacuum filters, and dual-cell gravity solids concentrators. Two or more of these processes can be used within the same system to obtain a higher degree of solids concentration than would be attainable using only one process.

b. Filter wash water. Wash water volumes range from about 1 to 3 percent of the raw water processed. Disposal of filter wash water may be by discharge to natural receiving waters, by recovery and reuse of the wash water, by lagooning, or by discharge to a sanitary sewer.

(1) Discharge to natural receiving waters. This means of disposal may be practiced if it does not affect other water users adversely.

(2) Recovery and reuse. Recovery and reuse are accomplished by mixing the filter wash water with the influent raw water before or at the rapid-mix basin. In most cases, the wash water is collected in a recovery basin from which it is pumped into the plant raw water inflow. Suspended solids in the wash water settle along with other solids in the plant basins and the only wastewater discharged from the plant is that associated with basin sludge removal. The recycling of filter wash water serves as a water conservation technique and may have economic advantages over other means of disposal. In some instances, the suspended particles in the filter wash water may not settle out easily, and recycling may, under some circumstances, cause abbreviated

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filter runs. Another potential drawback of wash water recycling, particularly if the raw water has a high plankton count, is a build-up of algae in the recycled suspended matter and consequent increase of taste and odor in the water.

(3) Lagooning. Lagooning is an accepted means of managing filter wash water flows. If a separate lagoon is used for the wash water, the supernatant from the lagoon may be recycled through the water treatment plant.

(4) Discharge to sanitary sewer. Filter wash water may also be discharged to a sanitary sewer. Rate of flow regulation generally will be required to avoid sewer surcharge. This mode of disposal is most applicable if the characteristics of the wash water make it unsuitable for recycling.

c. Waste brines. Two types of brine flows can be generated at water treatment plants, regeneration brines from cation-exchange softeners and waste brines from desalination processes. These brines are very similar as far as disposal techniques are concerned. Methods of brine disposal include regulated discharge to surface waters, "evaporation" pond disposal, and discharge to a sanitary sewer. If pond disposal is utilized, the ponds must be lined to prevent seepage of brine into the ground water. Depending on the location of the water treatment plant and the volume of brine generated, these methods may vary widely in cost, reliability, and environmental acceptability.

(1) Discharge to surface waters. Unregulated discharge to surface waters is usually unacceptable. An exception is that waste brines from a desalting plant near the ocean can probably be discharged to the ocean if precautions are taken in the design of the outfall to insure that the brine is adequately diluted. On large rivers, it may be possible to store wastes in watertight ponds during low-flow periods and release them at a controlled rate during high flows. This may be an acceptable procedure if it can be shown that the wastes do not significantly affect water quality when released during the high-flow period.

(2) Evaporation ponds. Evaporation ponds can be used for disposal of waste brines if evaporation rates are high, precipitation is minimal, and land costs are low. In most localities, precautions must be taken to insure that brine ponds do not overflow or leak into the ground water. Watertight ponds are required for most situations.

(3) Discharge to a sanitary sewer. Disposal by regulated discharge to a sanitary sewer may be practiced if wastewater treatment plant operating personnel and regulatory authorities approve. Conventional wastewater treatment processes do nothing to remove dissolved minerals from water. Hence, all of the dissolved salts

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discharged to the sanitary sewer will eventually be present in the effluent from the wastewater treatment plant.